

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: June 17, 2020

TO: Sheri Snowbank – Spooner Service Center

FROM: Wade Strickland – WY/3

Diane Greil for US

SUBJECT: Water Quality-Based Effluent Limitations for the Saputo Cheese USA, Inc. – Almena
WPDES Permit No. WI-0050725-09-0

This is in response to your request for an evaluation of water quality-based effluent limitations (WQBELs) for facility planning using Chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from Saputo Cheese USA, Inc. – Almena (SCUSA – Almena) in Barron County. This industrial facility discharges to the Unnamed Tributary to the Hay River, located in the Hay River Watershed in the Lower Chippewa Basin. This discharge is included in the Tainter Lake/Lake Menomin TMDL as approved by EPA. The evaluation of the permit recommendations is discussed in more detail in the attached report.

SCUSA – Almena has requested the continuous use of Outfall 002 for two possible discharge scenarios; COW water and the mixture of COW water with process wastewater. Both potential surface water discharge scenarios will be evaluated in this memorandum. Reasonable potential to exceed any applicable surface water criteria is not considered for any limits required to be in a WPDES permit on the basis of need, with the exception of WET.

Based on our review, the following recommendations are made on a chemical-specific basis at Outfall 002:

COW Water Discharge:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						
BOD ₅	20 mg/L 34 lbs/day			10 mg/L 17 lbs/day		2, 3
TSS	20 mg/L 44 lbs/day			10 mg/L 22 lbs/day		2
pH	9.0 s.u.	6.0 s.u.				
Dissolved Oxygen		7.0 mg/L				
Ammonia Nitrogen						
April – May	20 mg/L		7.5 mg/L	3.0 mg/L		
June – September	20 mg/L		4.7 mg/L	1.9 mg/L		
October – March	20 mg/L		10 mg/L	4.1 mg/L		1, 4
Phosphorus						
TBEL				1.0 mg/L		
s. 217.13 WQBEL				0.225 mg/L	0.075 mg/L	
TMDL				0.013 lbs/day	0.054 lbs/day	1, 5
Hardness (as CaCO ₃)						6
Arsenic (Total Recoverable)	340 µg/L		150 µg/L	13 µg/L		1
Cadmium (Total Recoverable)	15 µg/L		3.1 µg/L	3.1 µg/L		1, 3, 6

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Chromium (Total Recoverable)	2,300 µg/L		170 µg/L	170 µg/L		1, 3, 6
Copper (Total Recoverable)	21 µg/L		13 µg/L	13 µg/L		1, 3, 6
Lead (Total Recoverable)	140 µg/L		38 µg/L	38 µg/L		1, 3, 6
Nickel (Total Recoverable)	610 µg/L		68 µg/L	68 µg/L		1, 3, 6
Zinc (Total Recoverable)	160 µg/L		160 µg/L	160 µg/L		1, 3, 6
Chloride	760 mg/L		400 mg/L	400 mg/L		1, 3
Mercury (Total Recoverable)	1.3 ng/L			1.3 ng/L		1, 3
Nitrite + Nitrate						7
Nitrogen, Total Kjeldahl						7
Total Nitrogen						7
Temperature	Variable		Variable			8
Acute WET						9, 10
Chronic WET						9, 11

Footnotes:

1. Limit implementation is dependent on the reasonable potential of the discharge to exceed the appropriate water quality criterion. Therefore, limits for the substance will not be implemented without representative data for evaluation. Effluent monitoring of the specific substance is recommended after facility upgrades are operational to determine if limits are needed.
2. The concentration limits are WQBELs based on the receiving water characteristics. The mass limits are categorical limits based on ch. NR 240, Wis. Adm. Code.
3. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7) are included in bold.
4. The variable daily maximum ammonia nitrogen limit table corresponding to various effluent pH values may be included in the permit in place of a single limit of 20 mg/L. These limits apply year-round.

Daily Maximum Ammonia Nitrogen Limits – WWSF

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	54	7.0 < pH ≤ 7.1	33	8.0 < pH ≤ 8.1	6.9
6.1 < pH ≤ 6.2	53	7.1 < pH ≤ 7.2	30	8.1 < pH ≤ 8.2	5.7
6.2 < pH ≤ 6.3	52	7.2 < pH ≤ 7.3	26	8.2 < pH ≤ 8.3	4.7
6.3 < pH ≤ 6.4	51	7.3 < pH ≤ 7.4	23	8.3 < pH ≤ 8.4	3.9
6.4 < pH ≤ 6.5	49	7.4 < pH ≤ 7.5	20	8.4 < pH ≤ 8.5	3.2
6.5 < pH ≤ 6.6	47	7.5 < pH ≤ 7.6	17	8.5 < pH ≤ 8.6	2.7
6.6 < pH ≤ 6.7	45	7.6 < pH ≤ 7.7	14	8.6 < pH ≤ 8.7	2.2
6.7 < pH ≤ 6.8	42	7.7 < pH ≤ 7.8	12	8.7 < pH ≤ 8.8	1.8
6.8 < pH ≤ 6.9	39	7.8 < pH ≤ 7.9	10	8.8 < pH ≤ 8.9	1.6
6.9 < pH ≤ 7.0	36	7.9 < pH ≤ 8.0	8.4	8.9 < pH ≤ 9.0	1.3

5. The phosphorus mass limit of 0.013 lbs/day as a monthly average is based on the Total Maximum Daily Load (TMDL) for Tainter Lake/Lake Menomin to address phosphorus water quality impairments within the TMDL area. The TMDL was approved by EPA on September 2012. This TMDL limit is exempt from footnote 1 and should be included in the permit regardless of reasonable potential. The TBEL of 1.0 mg/L is a monthly average expressed as a 12-month rolling average.

6. Hardness monitoring is recommended because of the relationship between hardness and daily maximum limits based on acute toxicity criteria. Effluent hardness is also used to calculate weekly average limits based on chronic toxicity criteria due to the receiving water low flows equal to zero. The metals limits above were calculated using an effluent hardness of 136 mg/L and will change at the next issuance if the measured hardness is different than this.
7. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, quarterly total nitrogen (total kjeldahl nitrogen and nitrate/nitrite) monitoring is recommended for all class A cheese plants. Total Nitrogen is the sum of nitrate (NO₃), nitrite (NO₂), and total kjeldahl nitrogen (all expressed as N).
8. These are the WQBELs for temperature. Options for potential relief from limits are explained in additional detail in the August 15, 2013 Department *Guidance for Implementation of Wisconsin's Thermal Water Quality Standards*

<http://dnr.wi.gov/topic/surfacewater/documents/ThermalGuidance2edition8152013.pdf>

Month	Daily Maximum (°F)	Weekly Average (°F)
JAN	76	49
FEB	76	50
MAR	77	52
APR	79	55
MAY	82	65
JUN	84	76
JUL	85	81
AUG	84	81
SEP	82	73
OCT	80	61
NOV	77	49
DEC	76	49

9. Any recommended monitoring should take place after the facility is operational with the upgrades. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge and should continue after the permit expiration date (until the permit is reissued).
10. Three acute tests are recommended during the reissued permit term. According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests.
11. Three chronic tests are recommended during the reissued permit term. The Instream Waste Concentration (IWC) to assess chronic test results is 100%. According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), chronic testing shall be performed using a dilution series of 100%, 75%, 50%, 25% & 12.5% and the dilution water used in WET tests conducted on Outfall 002 shall be a grab sample collected from the Unnamed Tributary to the Hay River.

COW Water & Process Wastewater Mixture Discharge:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						
BOD ₅	20 mg/L 62 lbs/day			10 mg/L 31 lbs/day		2, 3

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
TSS	20 mg/L 78 lbs/day			10 mg/L 39 lbs/day		2
pH	9.0 s.u.	6.0 s.u.				
Dissolved Oxygen		7.0 mg/L				
Ammonia Nitrogen						
April – May	20 mg/L		7.5 mg/L	3.0 mg/L		
June – September	20 mg/L		4.7 mg/L	1.9 mg/L		
October – March	20 mg/L		10 mg/L	4.1 mg/L		1, 4
Phosphorus						
TBEL				1.0 mg/L		
s. 217.13 WQBEL				0.225 mg/L	0.075 mg/L	
TMDL				0.013 lbs/day	0.36 lbs/day	1, 5
Hardness (as CaCO ₃)						6
Arsenic (Total Recoverable)	340 µg/L		150 µg/L	13 µg/L		1
Cadmium (Total Recoverable)	15 µg/L		3.1 µg/L	3.1 µg/L		1, 3, 6
Chromium (Total Recoverable)	2,300 µg/L		170 µg/L	170 µg/L		1, 3, 6
Copper (Total Recoverable)	21 µg/L		13 µg/L	13 µg/L		1, 3, 6
Lead (Total Recoverable)	140 µg/L		38 µg/L	38 µg/L		1, 3, 6
Nickel (Total Recoverable)	610 µg/L		68 µg/L	68 µg/L		1, 3, 6
Zinc (Total Recoverable)	160 µg/L		160 µg/L	160 µg/L		1, 3, 6
Chloride	760 mg/L		400 mg/L	400 mg/L		1, 3
Mercury (Total Recoverable)	1.3 ng/L			1.3 ng/L		1, 3
Nitrite + Nitrate						7
Nitrogen, Total Kjeldahl						7
Total Nitrogen						7
Temperature	Variable		Variable			8
Acute WET	1.0 TUa					9, 10
Chronic WET				1.0 TUC		9, 11

Footnotes:

1. Limit implementation is dependent on the reasonable potential of the discharge to exceed the appropriate water quality criterion. Therefore, limits for the substance will not be implemented without representative data for evaluation. Effluent monitoring of the specific substance is recommended after facility upgrades are operational to determine if limits are needed.
2. The concentration limits are WQBELs based on the receiving water characteristics. The mass limits are categorical limits based on ch. NR 240, Wis. Adm. Code.
3. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7) are included in bold.
4. The variable daily maximum ammonia nitrogen limit table corresponding to various effluent pH values may be included in the permit in place of a single limit of 20 mg/L. These limits apply year-round.

Daily Maximum Ammonia Nitrogen Limits – WWSF

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
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6.9 < pH ≤ 7.0	36	7.9 < pH ≤ 8.0	8.4	8.9 < pH ≤ 9.0	1.3

5. The phosphorus mass limit of 0.013 lbs/day as a monthly average is based on the Total Maximum Daily Load (TMDL) for Tainter Lake/Lake Menomin to address phosphorus water quality impairments within the TMDL area. The TMDL was approved by EPA on September 2012. This TMDL limit is exempt from footnote 1 and should be included in the permit regardless of reasonable potential. The TBEL of 1.0 mg/L is a monthly average expressed as a 12-month rolling average.
6. Hardness monitoring is recommended because of the relationship between hardness and daily maximum limits based on acute toxicity criteria. Effluent hardness is also used to calculate weekly average limits based on chronic toxicity criteria due to the receiving water low flows equal to zero. The metals limits above were calculated using an effluent hardness of 136 mg/L and will change at the next issuance if the measured hardness is different than this.
7. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, quarterly total nitrogen (total kjeldahl nitrogen and nitrate/nitrite) monitoring is recommended for all class A cheese plants. Total Nitrogen is the sum of nitrate (NO₃), nitrite (NO₂), and total kjeldahl nitrogen (all expressed as N).
8. These are the WQBELs for temperature. Options for potential relief from limits are explained in additional detail in the August 15, 2013 Department *Guidance for Implementation of Wisconsin's Thermal Water Quality Standards*
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JUN	84	76
JUL	85	81
AUG	84	81
SEP	82	73
OCT	80	61
NOV	77	49
DEC	76	49

9. Any recommended monitoring should take place after the facility is operational with the upgrades. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge and should continue after the permit expiration date (until the permit is reissued). It is recommended that a schedule be included in the permit which allows time for a toxicity reduction evaluation (TRE) to be completed to find and remove the source of the toxicity and achieve compliance with the new WET limits. The WET limits should become effective and the recommended monitoring should begin after the TRE schedule has been completed. Guidance related to TRE schedules is provided in Chapter 1.12 of the WET Guidance Document.
10. Annual acute tests and the acute limit of 1.0 TU_a as a daily maximum are recommended during the reissued permit term. According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests.
11. Annual chronic tests and the chronic limit of 1.0 TU_c as a monthly average are recommended during the reissued permit term. The Instream Waste Concentration (IWC) to assess chronic test results is 100%. According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), chronic testing shall be performed using a dilution series of 100%, 75%, 50%, 25% & 12.5% and the dilution water used in WET tests conducted on Outfall 002 shall be a grab sample collected from the Unnamed Tributary to the Hay River.

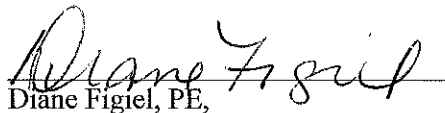
Because this is an existing discharge, the test for antidegradation is whether any of the effluent limitations is an increased discharge as defined in ch. NR 207, Wis. Adm Code. "Increased discharge" means any change in concentration, level or loading of a substance which would exceed an effluent limitation specified in a current WPDES permit. No effluent limitations outlined above would constitute an increased discharge as defined in ch. NR 207 as they are equal to or less than the existing permit limitations or are the first-time imposition of the limit. Therefore, the limits do not change due to this consideration.

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Michael Polkinghorn at (608) 266-3906 (Michael.Polkinghorn@wisconsin.gov) and Diane Figiel at (608) 264-6274 (Diane.Figiel@wisconsin.gov).

Attachments (6) – Narrative, Map, Process Flowchart, BOD/TSS Technology Based Effluent Limits Calculation, Thermal Table, & Data Source Table

PREPARED BY: Michael A. Polkinghorn, E.I.T. – Water Resources Engineer

APPROVED BY:


Diane Figiel, PE,
Water Resources Engineer

Date: 4/17/2020

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Michelle Balk, P.E., Northern Region Wastewater Supervisor – Spooner Service Center
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Kari Fleming, Environmental Toxicologist – WY/3
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**Water Quality-Based Effluent Limitations for
Saputo Cheese USA, Inc. – Almena**

WPDES Permit No. WI-0050725-09-0

Prepared by: Michael A. Polkinghorn, E.I.T.

PART 1 – BACKGROUND INFORMATION

Facility Description:

Saputo Cheese USA – Almena (SCUSA – Almena) operates a cheese making and whey processing facility where natural cheeses, cream and whey/whey by-products are produced using whole milk as the primary raw material. The wastewater generated from milk receiving, cheese making, whey processing and product containment/shipping operations processing of the raw milk includes:

- Whey plant evaporator condensate water, or COW water, is utilized primarily for steam generation and clean up water. Outfall 002 historically discharged this water to an Unnamed Tributary to the Hay River only during emergencies. Outfall 002 was last used in April 2000 and has not been used during the current permit term.
- Process wastewater generated from equipment, tank and floor cleanup operations as well as sanitary waste from the facility is continuously equalized and biologically treated in a two stage aerated lagoon system with secondary clarification. The treated wastewater is stored in a 22 million gallon capacity, four lagoon storage system until it is spray irrigated (Outfall 001) during the warm weather months (April-November) over approximately 172 acres of sprayfields managed for crop production and nutrient recycling. Wastewater sludge generated during biological treatment is also landspread on approved sites (Outfall 004).
- High strength wastewater is generated from process source areas contributing milk solids including separator desludge and primary wash down of the whey evaporator. A portion of the high strength waste lactose permeate is also landspread on approved agriculture fields (Outfall 003).

SCUSA – Almena has requested the continuous use of Outfall 002 for two possible discharge scenarios; COW water and the mixture of COW water with process wastewater. Both potential surface water discharge scenarios will be evaluated in this memorandum for all applicable substances where any limits calculated in this evaluation are for facility planning purposes only. Reasonable potential to exceed any applicable surface water criteria is not considered for any limits required to be in a WPDES permit on the basis of need, with the exception of WET.

Water quality based effluent limits are addressed for Outfall 002 in this memo. Attachment #2 is a map of the area showing the approximate location of Outfall 002.

Existing Permit Limitations: The current permit which expired on 03/31/2020, includes the following effluent limitations and monitoring requirements at Outfall 002.

Attachment #1

Parameter	Daily Maximum	Daily Minimum	Monthly Average	Footnotes
Flow Rate				2
BOD ₅	40 mg/L		20 mg/L	1
TSS	40 mg/L		20 mg/L	1
pH	9.0 s.u.	6.0 s.u.		
Dissolved Oxygen		4.0 mg/L		1
Ammonia Nitrogen				2
Phosphorus				2
Temperature	100 °F			1
Conductivity				1
Acute WET				2
Chronic WET				2

Footnotes:

1. Because the water quality criteria (WQC) and reference effluent flow rates have changed, limitations for these water quality characteristics need to be re-evaluated at this time.
2. Monitoring only

Receiving Water Information:

- Name: Unnamed Tributary to the Hay River
- WBIC: 3000238
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warm water sport fish (WWSF) community, non-public water supply.
 - Limits in the current permit are based on the limited aquatic life (LAL) classification for the Unnamed Tributary to the Hay River. This classification is not in ch. NR 104 and has been included in the latest rule revision proposal to ch. NR 104 dated April 2003. There are no use designation survey documentation that support this classification from SE ¼, NE ¼, Section 12; T33N – R14W (Outfall 002) downstream to the NE ¼, Section 8; T33N – R13W (Town road crossing – 10 ½ avenue), just upstream of the confluence of the Hay River. A preliminary assessment to determine the receiving water's natural biological community status was conducted in September 2019 and was inconclusive due to the excessive growth of reed canary grass and cattails throughout the survey area. This assessment is planned to be conducted again approximately in early June 2020 for improved fish survey results. After discussion with the Department water quality standard specialist the estimated additional yearly flow of the proposed discharge to the receiving water would justify the "Warm" classification with respect to the proposed *Natural Community Verification & Aquatic Life Designated Use* rule package. Therefore, criteria based on a WWSF classification are used in this evaluation.
- Low Flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q₁₀ and 7-Q₂ values are estimated at SE ¼, NE ¼, Section 12; T33N - R14W, where Outfall 001 is located.
 - 7-Q₁₀ = 0 cfs (cubic feet per second)
 - 7-Q₂ = 0 cfs
 - 90-Q₁₀ = 0 cfs
 - Harmonic Mean Flow = 0 cfs
- Hardness: Effluent hardness is used in place of receiving water because there is no receiving water flow upstream of the discharge.

Attachment #1

- % of low flow used to calculate limits in accordance with s. NR 106.06 (4) (c) 5., Wis. Adm. Code: Not applicable where the receiving water low flows are equal to zero.
- Source of background concentration data: Background concentrations are not included because they do not impact the calculated WQBEL when the receiving water low flows are equal to zero.
- Multiple dischargers: None
- Impaired water status: The Unnamed Tributary is not listed as impaired under the Clean Water Act (CWA) Section 303d. The Hay River, approximately 3.5 miles downstream of Outfall 002, is listed as impaired for total phosphorus. Further downstream This discharge is included in the Tainter Lake/Lake Menomin TMDL as approved by EPA.

Effluent Information:

- Flow Rate(s):
 - COW Water:
Estimated maximum actual annual average = 31,331,965 gal/year = 0.0858 MGD (Million Gallons per Day)
 - Process Wastewater:
Estimated maximum actual annual average = 177,025,000 gal/year = 0.485 MGD
 - Combined:
Estimated maximum actual annual average = 208,356,965 gal/year = 0.571 MGD
- Hardness: 136 mg/L as CaCO₃. This value represents the geometric mean of data from WET testing (n = 13, October 1995 – December 1999). This hardness is representative of the current waste stream composition of Outfall 002 of COW water mixed with noncontact cooling water (NCCW). Hardness representative of the COW water only is expected to be lower which will result in limits for toxic substances to be more stringent. The mixed hardness is also used for the COW water in this evaluation.
- Acute dilution factor used in accordance with s. NR 106.06 (3) (c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water Source: Water supply from private wells
- Total Phosphorus Wasteload Allocation: 2.5 lbs/year = 0.007 lbs/day (see Table 5 of the TMDL report document: *Phosphorus TMDLs Tainter Lake and Lake Menomin* dated May 2012).
- Additives: The following chemicals are used for sanitation and cleaning purposes at the facility such as cleaning equipment and clean-in-place (CIP) tanks. Drains accepting these chemicals go to hauled out high strength waste or in process wastewater to the lagoons. Use frequency is on an as needed basis.
 - Phosphoric acid
 - Sodium Hypochlorite
 - Sodium Hydroxide

PART 2 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR TOXIC SUBSTANCES – EXCEPT AMMONIA NITROGEN

Permit limits for toxic substances are required whenever any of the following occur:

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the upper 99th percentile (or P₉₉) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)

Attachment #1

3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

Limits will be calculated for all “priority pollutants” excluding Dioxins and Furans as specified in s. NR 200.065, Table 1, Wis. Adm. Code and as shown in the following tables in this section. It should be noted that the hardness used is representative of the COW water and/or COW water mixed with NCCW. Therefore, limits for toxic substances with respect to COW water mixed with process wastewater would be different than those represented in this section with the exception of arsenic and chloride.

Acute Limits based on 1-Q₁₀:

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. Previously daily maximum limits for toxic substances were calculated as two times the ATC. However, changes to ch. NR 106, Wis. Adm. Code (September 1, 2016) require the Department to calculate acute limitations using the same mass balance equation as used for other limits along with the 1-Q₁₀ receiving water low flow to determine if more restrictive effluent limitations are needed to protect the receiving stream from discharges which may cause or contribute to an exceedance of the acute water quality standards.

$$\text{Limitation} = \frac{(\text{WQC}) (Q_s + (1-f) Q_e) - (Q_s - f Q_e) (C_s)}{Q_e}$$

Where:

WQC = Acute toxicity criterion or secondary acute value according to ch. NR 105

Q_s = average minimum 1-day flow which occurs once in 10 years (1-day Q₁₀)

if the 1-day Q₁₀ flow data is not available = 80% of the average minimum 7-day flow which occurs once in 10 years (7-day Q₁₀).

Q_e = Effluent flow (in units of volume per unit time) as specified in s. NR 106.06(4)(d), Wis. Adm. Code.

f = Fraction of the effluent flow that is withdrawn from the receiving water, and

C_s = Background concentration of the substance (in units of mass per unit volume) as specified in s. NR 106.06(4)(e), Wis. Adm. Code.

As a rule of thumb, if the receiving water is effluent dominated under low stream flow conditions, the 1-Q₁₀ method of limit calculation produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations. This is the case for SCUSA - Almena and the limits are set based on the 1-Q₁₀ flow.

The following tables list the calculated water quality-based effluent limitations for this discharge. All concentrations are expressed in terms of micrograms per Liter (µg/L), except for hardness and chloride (mg/L) and mercury (ng/L).

Daily Maximum Limits based on Acute Toxicity Criteria (ATC):

RECEIVING WATER FLOW = 0 cfs, (1-Q₁₀ (estimated as 80% of 7-Q₁₀)), as specified in s. NR 106.06 (3) (bm), Wis. Adm. Code.

SUBSTANCE	REF. HARD. mg/L	ATC	MAX. EFFL. LIMIT*
Arsenic		340	340
Cadmium	136	14.7	15

Attachment #1

SUBSTANCE	REF. HARD. mg/L	ATC	MAX. EFFL. LIMIT*
Chromium	136	2,319	2,300
Copper	136	20.7	21
Lead	136	144	140
Mercury		830	830
Nickel	136	609	610
Zinc	136	158	160
Chloride (mg/L)		757	760

* Per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016 consideration of ambient concentrations and 1-Q₁₀ flow rates yields a more restrictive limit than the 2 × ATC method of limit calculation.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC):

RECEIVING WATER FLOW = 0 cfs (¼ of the 7-Q₁₀), as specified in s. NR 106.06 (4) (c), Wis. Adm. Code

SUBSTANCE	REF. HARD.* mg/L	CTC	WEEKLY AVE. LIMIT
Arsenic		152.2	150
Cadmium	136	3.13	3.1
Chromium	136	169.94	170
Copper	136	13.47	13
Lead	136	37.69	38
Mercury		440	440
Nickel	136	67.70	68
Zinc	136	157.61	160
Chloride (mg/L)		395	400

Monthly Average Limits based on Wildlife Criteria (WC):

RECEIVING WATER FLOW = 0 cfs (¼ of the 90-Q₁₀), as specified in s. NR 106.06 (4), Wis. Adm. Code

SUBSTANCE	WC	MO'LY AVE. LIMIT
Mercury (ng/L)	1.3	1.3

Monthly Average Limits based on Human Threshold Criteria (HTC):

RECEIVING WATER FLOW = 0 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06 (4), Wis. Adm. Code.

SUBSTANCE	HTC	MO'LY AVE. LIMIT
Cadmium	370	370
Chromium (+3)	3.82x10 ⁶	3.8x10 ⁶
Lead	140	140
Nickel	43,000	43,000

Monthly Average Limits based on Human Cancer Criteria (HCC):

RECEIVING WATER FLOW = 0 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06 (4), Wis. Adm. Code.

SUBSTANCE	HCC	MO'LY AVE. LIMIT
Arsenic	13.3	13

PART 3 – BOD₅ & TOTAL SUSPENDED SOLIDS**Water Quality-Based BOD₅ & TSS Effluent Limits:**

In establishing BOD₅ limitations, the primary intent is to prevent a lowering of dissolved oxygen levels in the receiving water below water quality standards as specified in ss. NR 102.04(4)(a) and (b). The 26-lb method is the most frequently used approach for calculating BOD₅ limits when resources are not available to develop a detailed water quality model. This simplified model was developed in the 1970's by the Wisconsin Committee on Water Pollution on the Fox, Wisconsin, Oconto, and Flambeau Rivers. Further studies throughout the 1970's proved this model to be relatively accurate. The model has since then been used by the Department on many occasions when resources are not available to perform a site-specific model. The "26" value stems from the following equation:

$$\frac{26 \text{ lbs/day}}{\text{ft}^3/\text{sec}} * \frac{1 \text{ day}}{86,400 \text{ sec}} * \frac{454,000 \text{ mg}}{\text{lbs}} * \frac{1 \text{ ft}^3}{28.32 \text{ L}} = 4.8 = 2.4 * 2 \text{ mg/L}$$

The 4.8 mg/L has been calculated by taking 2.4 mg/L which is the number one receives when converting 26 lbs. of BOD/day/cfs into mg/L, multiplied by 2.0 which is the change in the DO level. A typical background DO level for Wisconsin waters is 7 mg/L, so a 2 mg/L decrease is allowed to meet the 5 mg/L standard for warm water streams. The above relationship is temperature dependent and an appropriate temperature correction factor is applied. The 26-lb method is based on a typical 24°C summer value for warm water streams. Adjustments for temperature are made using the following equation:

$$k_t = k_{24} (0.967^{(T-24)})$$

Where k_{24} = 26 lbs. of BOD/day/cfs

Calculations based on Full Assimilative Capacity at 7-Q₁₀ Conditions:

$$Limitation(mg / L) = 2.4(DO_{stream} - DO_{std}) \left(\frac{(Q_{10} + Q_{eff})}{Q_{eff}} \right) (0.967^{(T-24)})$$

Where:

Q_{eff} = effluent flow = 0.0858 & 0.571 MGD

DO_{stream} = background dissolved oxygen = 7 mg/L

DO_{std} = dissolved oxygen criteria from s. NR 102.04(4) = 5 mg/L

7-Q₁₀ = 0 cfs

T = Receiving water temperature from s. NR 102.25

Because no dilution is available in the receiving water, the calculated limits would be the lowest that the

Department typically gives to industrial facilities. The recommended effluent limitation is 10 mg/L as a monthly average applied year round. As there is little or no dilution available under low flow conditions, a dissolved oxygen limit of 7.0 mg/L as a daily minimum applied year round is also recommended. This is consistent with the assumed dissolved oxygen effluent concentration in the calculation of the BOD₅ limitations.

Mass limits for BOD₅ from the water quality based effluent limits are not recommended because the receiving water is completely effluent dominated. The technology-based effluent limits of 62 and 31 lbs/day as a daily maximum and monthly average respectively are required based on s. NR 240.12.

In the absence of a TMDL, TSS limits are typically set equal to the BOD₅ limits unless the wastewater process is not biological in which an alternative TSS limit may be given based on best professional judgement. Department guidance suggests TSS limits shall be set equal to BOD₅ limits unless BOD₅ limits are less than 10 mg/L, in which case TSS limits shall be set equal to 10 mg/L. The technology-based effluent limits of 78 and 39 lbs/day as a daily maximum and monthly average respectively are required as described in s. NR 240.12. This is expected to meet compliance with s. NR 102.04(1) (a) & (b), in which the narrative criteria for TSS is outlined.

PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR AMMONIA NITROGEN

The State of Wisconsin promulgated revised water quality standards for ammonia nitrogen in ch. NR 105, Wis. Adm. Code, effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life.

Daily Maximum Limits based on Acute Toxicity Criteria (ATC):

Daily maximum limitations are based on acute toxicity criteria in ch. NR 105, Wis. Adm. Code, which are a function of the effluent pH and the receiving water classification. The acute toxicity criterion (ATC) for ammonia is calculated using the following equation.

$$\text{ATC in mg/L} = [A \div (1 + 10^{(7.204 - \text{pH})})] + [B \div (1 + 10^{(\text{pH} - 7.204)})]$$

Where:

A = 0.411 and B = 58.4 for a Warm Water Sport fishery, and
pH (s.u.) = that characteristic of the effluent.

An estimate of the maximum expected effluent pH is not available for either discharge scenario. For the purpose of calculation, a pH of 7.50 is assumed for either discharge. Substituting a value of 7.50 s.u. into the equation above yields an ATC = 19.89 mg/L and a computed daily maximum limit of 40 mg/L using two times the ATC.

Potential Changes to Daily Maximum Ammonia Nitrogen Effluent Limitations:

Subchapter IV of ch. NR 106, Wis. Adm. Code (effective September 1, 2016) specifies methods for the use of the 1-Q₁₀ receiving water low flow to calculate daily maximum ammonia nitrogen limits if it is determined that the previous method of acute ammonia limit calculation (2×ATC) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits shall apply.

Attachment #1

The calculated daily maximum ammonia nitrogen effluent limits using the mass balance approach with the 1-Q₁₀ (estimated as 80 % of 7-Q₁₀) and the 2×ATC approach are shown below.

	Ammonia Nitrogen Limit mg/L
2×ATC	40
1-Q ₁₀	20

The 1-Q₁₀ method yields the most stringent limits for SCUSA – Almena. This limit is always more stringent than the limit calculated by the 2×ATC method when the receiving water low-flow is zero.

Presented below is a table of daily maximum limitations corresponding to various effluent pH values. The facility has the option to have a variable daily maximum ammonia nitrogen table dependent on the daily measured pH in place of a single limit as described in s. NR 106.32(2)(d)2. The use of this table is not necessarily recommended in the reissued permit but is included here for informational purposes.

Daily Maximum Ammonia Nitrogen Limits – WWSF

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	54	7.0 < pH ≤ 7.1	33	8.0 < pH ≤ 8.1	6.9
6.1 < pH ≤ 6.2	53	7.1 < pH ≤ 7.2	30	8.1 < pH ≤ 8.2	5.7
6.2 < pH ≤ 6.3	52	7.2 < pH ≤ 7.3	26	8.2 < pH ≤ 8.3	4.7
6.3 < pH ≤ 6.4	51	7.3 < pH ≤ 7.4	23	8.3 < pH ≤ 8.4	3.9
6.4 < pH ≤ 6.5	49	7.4 < pH ≤ 7.5	20	8.4 < pH ≤ 8.5	3.2
6.5 < pH ≤ 6.6	47	7.5 < pH ≤ 7.6	17	8.5 < pH ≤ 8.6	2.7
6.6 < pH ≤ 6.7	45	7.6 < pH ≤ 7.7	14	8.6 < pH ≤ 8.7	2.2
6.7 < pH ≤ 6.8	42	7.7 < pH ≤ 7.8	12	8.7 < pH ≤ 8.8	1.8
6.8 < pH ≤ 6.9	39	7.8 < pH ≤ 7.9	10	8.8 < pH ≤ 8.9	1.6
6.9 < pH ≤ 7.0	36	7.9 < pH ≤ 8.0	8.4	8.9 < pH ≤ 9.0	1.3

Weekly Average & Monthly Average Limits based on Chronic Toxicity Criteria (CTC):

Weekly average and monthly average limits for ammonia nitrogen are based on chronic toxicity criteria in ch. NR 105, Wis. Adm. Code. The 30-day chronic toxicity criterion (CTC) for ammonia in waters classified as a Warm Water Sport Fish Community is calculated by the following equation, according to subchapter IV of NR 106, Wis. Adm. Code.

$$CTC = E \times \{ [0.0676 \div (1 + 10^{(7.688 - pH)})] + [2.912 \div (1 + 10^{(pH - 7.688)})] \} \times C$$

Where:

pH = the pH (s.u.) of the receiving water,

E = 0.854,

C = the minimum of 2.85 or $1.45 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Present), or

C = $1.45 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Absent), and

T = the temperature (°C) of the receiving water – (Early Life Stages Present), or

T = the maximum of the actual temperature (°C) and 7 – (Early Life Stages Absent)

Attachment #1

The 4-day criterion is equal to the 30-day criterion multiplied by 2.5. The 4-day criteria are used in a mass-balance equation with the 7-Q₁₀ (4-Q₃, if available) to derive weekly average limitations. And the 30-day criteria are used with the 30-Q₅ (estimated as 85% of the 7-Q₂ if the 30-Q₅ is not available) to derive monthly average limitations. The stream flow value is further adjusted to temperature; 100% of the flow is used if the Temperature ≥ 16 °C, 25% of the flow is used if the Temperature < 11 °C, and 50% of the flow is used if the Temperature ≥ 11 °C but < 16 °C.

Section NR 106.32 (3), Wis. Adm. Code, provides a mechanism for less stringent weekly average and monthly average effluent limitations when early life stages (ELS) of critical organisms are absent from the receiving water. This applies only when the water temperature is less than 14.5 °C, during the winter and spring months. Burbot, an early spawning species, are not believed to be present in the Unnamed Tributary to the Hay River, based on the note under s. NR 106.32(3)(a)4. So “ELS Absent” criteria apply from October through March, and “ELS Present” criteria will apply from April through September for a WWSF classification.

Since minimal ambient data is available, the “default” basin assumed values are used for Temperature, pH and background ammonia concentrations, shown in the table below, with the resulting criteria and effluent limitations.

Unnamed Tributary (WWSF)		Spring April & May	Summer June – Sept.	Winter Oct. – March
Effluent Flow	Q _e (MGD)	NA	NA	NA
Background Information	7-Q ₁₀ (cfs)	0	0	0
	7-Q ₂ (cfs)	0	0	0
	Ammonia (mg/L)	NA	NA	NA
	Average Temperature (°C)	NA	NA	NA
	Maximum Temperature (°C)	14	21	10
	pH (s.u.)	7.85	7.90	7.84
	% of Flow used	NA	NA	NA
	Reference Weekly Flow (cfs)	0	0	0
	Reference Monthly Flow (cfs)	0	0	0
Criteria mg/L	4-day Chronic			
	Early Life Stages Present	7.47	4.74	
	Early Life Stages Absent			10.19
	30-day Chronic			
	Early Life Stages Present	2.99	1.90	
Effluent Limitations mg/L	Early Life Stages Absent			4.08
	Weekly Average			
	Early Life Stages Present	7.5	4.7	
	Early Life Stages Absent			10
	Monthly Average			
	Early Life Stages Present	3.0	1.9	
	Early Life Stages Absent			4.1

**“NA” denotes not applicable when the receiving water low-flow is zero.

Conclusions and Recommendations:

In summary, after rounding to two significant figures, the following ammonia nitrogen limitations are recommended. No mass limitations are recommended in accordance with s. NR 106.32(5), Wis. Adm Code.

Attachment #1

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
April & May	20	7.5	3.0
June – September	20	4.7	1.9
October – March	20	10	4.1

PART 5 – PHOSPHORUS

Technology Based Phosphorus Limit:

Subchapter II of Chapter NR 217, Wis. Adm. Code, requires industrial facilities that discharge greater than 60 pounds of Total Phosphorus per month to comply with a 12-month rolling average limit of 1.0 mg/L, or an approved alternative concentration limit. There is not currently data available to evaluate the need for a technology based limit however at a design flow of 0.571 MGD this mass would be exceeded at a concentration of 0.42 mg/L.

Water Quality-Based Effluent Limits (WQBEL):

Revisions to administrative rules regulating phosphorus took effect on December 1, 2010. These rule revisions include additions to s. NR 102.06, Wis. Adm. Code, which establish phosphorus standards for surface waters. Subchapter III of NR 217, Wis. Adm. Code, establishes procedures for determining WQBELs for phosphorus, based on the applicable standards in ch. NR 102, Wis. Adm. Code.

TMDL Limits:

The Tainter Lake and Lake Menomin TMDL establishes total phosphorous wasteload allocations (WLAs) to reduce the loading to the Lakes by 65%. The Tainter Lake/Lake Menomin TMDL established a waste load allocation (WLA) for SCUSA – Almena of 2.5 lbs/yr and 0.007 lbs/day. A CV multiplier of 1.90 is chosen with the assumptions of CV = 0.6 and a monthly effluent monitoring scheme as described in *TMDL Implementation Guidance for Wastewater (2020)*. The TMDL mass limit shall be 1.90×0.007 lbs/day = 0.013 lbs/day expressed as a monthly average limit. This limit should be included in the reissued permit regardless of reasonable potential.

The WLAs do not address water quality standards for tributaries to the Lakes including the Red Cedar River. Therefore, in addition to the effluent limits based on the TMDL, limits are calculated to protect the immediate receiving water using the procedures in s. NR 217.13.

Section NR 217.13 Limits:

Section NR 102.06(3)(a), Wis. Adm. Code, specifically names river segments for which a phosphorus criterion of 0.100 mg/L applies. For other stream segments that are not specified in s. NR 102.06(3)(a), Wis. Adm. Code, s. NR 102.06(3)(b), Wis. Adm. Code, specifies a phosphorus criterion of 0.075 mg/L. The phosphorus criterion of 0.075 mg/L applies for the Unnamed Tributary to the Hay River.

The conservation of mass equation is described in s. NR 217.13 (2)(a), Wis. Adm. Code, for phosphorus WQBELs and includes variables of water quality criterion (WQC), receiving water flow rate (Q_s), effluent flow rate (Q_e), and upstream phosphorus concentrations (C_s):

$$\text{Limitation} = [(WQC)(Q_s + (1-f) Q_e) - (Q_s - f Q_e) (C_s)] / Q_e$$

Attachment #1

Where:

WQC = 0.075 mg/L for the Unnamed Tributary to the Hay River.

Q_s = 100% of the 7- Q_2 of 0 cfs

C_s = background concentration of phosphorus in the receiving water pursuant to s. NR 217.13(2)(d), Wis. Adm. Code

Q_e = effluent flow rate = 0.0858 & 0.571 MGD = 0.133 and 0.885 cfs

f = the fraction of effluent withdrawn from the receiving water = 0

Since the receiving water flow is equal to zero, the effluent limit is set equal to criteria.

Limit Expression:

According to s. NR 217.14 (2), Wis. Adm. Code, because the calculated WQBEL is less than or equal to 0.3 mg/L, the effluent limit of 0.075 mg/L may be expressed as a six-month average. If a concentration limitation expressed as a six-month average is included in the permit, a monthly average concentration limitation of 0.225 mg/L, equal to three times the WQBEL calculated under s. NR 217.13, Wis. Adm. Code shall also be included in the permit. The six-month average should be averaged during the months of May – October and November – April.

Mass Limits:

Because the Hay River is a phosphorus impaired water and the potential discharge is inside of the Tainter Lake/Lake Menomin TMDL model area, a mass limit for both are also required, pursuant to s. NR 217.14(1)(a), Wis. Adm. Code. The WQBEL final mass limit shall be $0.075 \text{ mg/L} \times 8.34 \times 0.0858 \text{ MGD} = 0.054 \text{ lbs/day}$ expressed as a six-month average. This same limit using an effluent flow of 0.571 MGD is 0.36 lbs/day expressed as a six-month average.

PART 6 – THERMAL

Surface water quality standards for temperature took effect on October 1, 2010. These regulations are detailed in chs. NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. Daily maximum and weekly average temperature criteria are available for the 12 different months of the year depending on the receiving water classification. Calculated limits are set equal to criteria based on a WWSF classification due to estimated zero low-flow in the receiving water. The complete thermal table used for calculations is included as attachment #5.

Month	Calculated Effluent Limit	
	Weekly	Daily
	Average Effluent Limitation (°F)	Maximum Effluent Limitation (°F)
JAN	49	76
FEB	50	76
MAR	52	77
APR	55	79

Attachment #1

Month	Calculated Effluent Limit	
	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)
MAY	65	82
JUN	76	84
JUL	81	85
AUG	81	84
SEP	73	82
OCT	61	80
NOV	49	77
DEC	49	76

Reasonable Potential:

Permit limits for temperature are recommended based on the procedures in s. NR 106.56, Wis. Adm. Code.

- An acute limit for temperature is recommended for each month in which the representative daily maximum effluent temperature for that month exceeds the acute WQBEL. The representative daily maximum effluent temperature is the greater of the following:
 - (a) The highest recorded representative daily maximum effluent temperature
 - (b) The projected 99th percentile of all representative daily maximum effluent temperatures
- A sub-lethal limitation for temperature is recommended for each month in which the representative weekly average effluent temperature for that month exceeds the weekly average WQBEL. The representative weekly average effluent temperature is the greater of the following:
 - (a) The highest weekly average effluent temperature for the month.
 - (b) The projected 99th percentile of all representative weekly average effluent temperatures for the month

The current permit has a limit of 100 °F as a daily maximum based on best professional judgement. Although no effluent temperature data is available from the current permit term temperature limits should be continued in the reissued permit based on s. NR 205.067(5).

The following general options are available for a facility to explore potential relief from the temperature limits:

- Effluent monitoring data: Verification or additional effluent monitoring (flow and/or temperature) may be appropriate if there were questions on the representativeness of the current effluent data.
- Monthly low receiving water flows: Contract with USGS to generate monthly low flow estimates for the receiving water to be used in place of the annual low flow.
- Mixing zone studies: A demonstration of rapid and complete mixing may allow for the use of a mixing zone other than the default 25%.
- Collection of site-specific ambient temperature: default background temperatures for streams in Wisconsin, so actual data from the direct receiving water may provide for relaxed thermal limits

but only if the site-specific temperatures are lower than the small stream defaults used in the above tables

- A variance to the water quality standard: This is typically considered to be the least preferable and most complex option as it requires the evaluation of the other alternatives.

These options are explained in additional detail in the August 15, 2013 Department *Guidance for Implementation of Wisconsin's Thermal Water Quality Standards*
<http://dnr.wi.gov/topic/surfacewater/documents/ThermalGuidance2edition8152013.pdf>

PART 7 – WHOLE EFFLUENT TOXICITY (WET)

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. Decisions below related to the selection of representative data and the need for WET limits were made according to ss. NR 106.08 and 106.09, Wis. Adm. Code. WET monitoring frequency and toxicity reduction evaluation (TRE) recommendations were made using the best professional judgment of staff familiar with the discharge after consideration of the guidance in the WET Program Guidance Document (October 29, 2019).

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC₅₀ (Lethal Concentration to 50% of the test organisms) greater than 100% effluent, according to s. NR 106.09 (2) (b), Wis. Adm Code.
- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC₂₅ (Inhibition Concentration) greater than the instream waste concentration (IWC), according to s. NR 106.09 (3) (b), Wis. Adm Code. The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWC of 100% shown in the WET Checklist summary below was calculated according to the following equation, as specified in s. NR 106.03(6), Wis. Adm Code:

$$\text{IWC (as \%)} = Q_e \div \{(1 - f) Q_e + Q_s\} \times 100$$

Where:

Q_e = annual average flow = 0.0858 and 0.571 MGD = 0.133 and 0.885 cfs

f = fraction of the Q_e withdrawn from the receiving water = 0

Q_s = 1/4 of the 7- Q_{10} = 0 cfs \div 4 = 0 cfs

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests, unless the use of different dilution water is approved by the Department prior to use. The primary control water must be specified in the WPDES permit.
- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), receiving water must be used as the dilution water and primary control in chronic WET tests, unless the use of different dilution water is approved by the Department prior to use. The dilution water used in WET tests conducted on Outfall 002 shall be a grab sample collected from the receiving water location, upstream and out of the influence of the mixing zone and any other known discharge. The specific receiving water location must be specified in the WPDES permit.

Attachment #1

- Shown below is a tabulation of all available WET data for Outfall 002. Efforts are made to ensure that decisions about WET monitoring and limits are made based on representative data, as specified in s. NR 106.08 (3), Wis. Adm Code. Data which is not believed to be representative of the discharge was not included in reasonable potential calculations. The table below differentiates between tests used and not used when making WET determinations.
- All historic WET data is representative of COW water or COW water mixed with NCCW. It is not known what WET data corresponds to either waste stream. Therefore, any WET data will be considered to be representative of COW water.

WET Data History

Date Test Initiated	Acute Results LC ₅₀ % (% survival in 100% effluent)				Chronic Results IC ₂₅ %				Footnotes or Comments
	<i>C. dubia</i>	Fathead minnow	Pass or Fail?	Used in RP?	<i>C. dubia</i>	Fathead Minnow	Pass or Fail?	Use in RP?	
10/26/1995	68.7	100	Fail	Yes	4.2	12.3	Fail	Yes	
12/07/1995	100	100	Pass	Yes	95	NA	Fail	No	1
03/26/1996	100	100	Pass	Yes					
09/24/1996	100	100	Pass	Yes	100	NA	NA	No	1
09/23/1997	100	100	Pass	Yes	60.6	75.7	Fail	Yes	
09/25/1997	0	100	Fail	Yes	14.7	82.8	Fail	Yes	
12/09/1997					68.4	100	Fail	Yes	
12/16/1997					65.2	100	Fail	Yes	
03/11/1998	100	100	Pass	Yes					
08/04/1998	70.7	100	Fail	Yes	47.9	NA	Fail	No	1
09/22/1998	74.2	100	Fail	Yes	58.5	100	Fail	Yes	
12/15/1998	100	100	Pass	Yes	66.3	40	Fail	Yes	
06/08/1999					NA	NA	NA	No	1
12/01/1999	100	100	Pass	Yes	65.9	100	Fail	Yes	

Footnotes:

1. *Qualified or Inconclusive Data.* Data quality concerns were noted during testing which calls into question the reliability of the test results.
 - According to s. NR 106.08, Wis. Adm. Code, WET reasonable potential is determined by multiplying the highest toxicity value that has been measured in the effluent by a safety factor, to predict the likelihood (95% probability) of toxicity occurring in the effluent above the applicable WET limit. The safety factor used in the equation changes based on the number of toxicity detects in the dataset. The fewer detects present, the higher the safety factor, because there is more uncertainty surrounding the predicted value. WET limits must be given, according to s. NR 106.08(6), Wis. Adm. Code, whenever the applicable Reasonable Potential equation results in a value greater than 1.0.

$$\text{Acute Reasonable Potential} = [(TU_a \text{ effluent}) (B)]$$

The lowest LC₅₀ value is zero (09/25/1997) which results in an undefined TU_a. The next lowest value of 68.7 (10/26/1995) is used for the reasonable potential calculation.

Attachment #1

TU_a (maximum) 100/LC ₅₀	B (multiplication factor from s. NR 106.08(5)(c), Wis. Adm. Code, Table 4)
100/68.7 = 1.5	2.6 Based on 4 detects

$$[(TU_a \text{ effluent}) (B)(AMZ)] = 3.8 > 1.0$$

$$\text{Chronic Reasonable Potential} = [(TU_c \text{ effluent}) (B)(IWC)]$$

TU_c (maximum) 100/IC ₂₅	B (multiplication factor from s. NR 106.08(5)(c), Wis. Adm. Code, Table 4)	IWC
100/4.2 = 24	1.9 Based on 8 detects	100%

$$[(TU_c \text{ effluent}) (B)(IWC)] = 45 > 1.0$$

Therefore, reasonable potential is shown acute and chronic WET using the procedures in s. NR 106.08(6) and representative data from October 1995 – December 1999.

Expression of WET limits

Acute WET limit = 1.0 TU_a expressed as a daily maximum

Chronic WET limit = 1.0 TU_c expressed as a monthly average

The WET Checklist was developed to help DNR staff make recommendations regarding WET limits, monitoring, and other related permit conditions. The Checklist indicates whether acute and chronic WET limits are needed, based on requirements specified in s. NR 106.08, Wis. Adm. Code. The Checklist steps the user through a series of questions, assesses points based on the potential for effluent toxicity, and suggests monitoring frequencies based on points accumulated during the Checklist analysis. As toxicity potential increases, more points accumulate, and more monitoring is recommended to ensure that toxicity is not occurring. A summary of the WET Checklist analysis completed for this permittee is shown in the table below. Staff recommendations based on best professional judgment are provided below the summary table. For guidance related to reasonable potential and the WET Checklist, see Chapter 1.3 of the WET Guidance Document: <http://dnr.wi.gov/topic/wastewater/WETguidance.html>.

WET Checklist Summary

	Acute	Chronic
AMZ/IWC	Not Applicable. 0 Points	IWC = 100%. 15 Points
Historical Data	11 tests used to calculate RP. 4 tests failed. No data available for the past 5 years. 5 Points	8 tests used to calculate RP. 8 tests failed. No data available for the past 5 years. 5 Points
Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. 0 Points	Same as Acute. 0 Points

Attachment #1

	Acute	Chronic
Receiving Water Classification	WWSF or < 4 mi to non-variance water. 5 Points	Same as Acute. 5 Points
Chemical-Specific Data	Effluent data not available. 0 Points	Effluent data not available. 0 Points
Additives	No additives used for wastewater treatment and are added prior to the treatment system. Therefore, not expected to be present in the effluent. 0 Points	All additives not used more than once per 4 days. 0 Points
Discharge Category	Dairy. 5 Points	Same as Acute. 5 Points
Wastewater Treatment	Secondary or Better. 0 Points	Same as Acute. 0 Points
Downstream Impacts	No impacts known. 0 Points	Same as Acute. 0 Points
Total Checklist Points:	15 Points	30 Points
Recommended Monitoring Frequency (from Checklist):	2 tests during permit term (year 2, 4, 6, etc.)	3 tests during permit term (year 1, 3, 5, etc.).
Limit Required?	Limit = 1.0 TU _a	Limit = 1.0 TU _c
TRE Recommended? (from Checklist)	Yes	Yes

COW Water Discharge:

- After consideration of the guidance provided in the Department's WET Program Guidance Document (2019) and other information described above two acute and three chronic WET tests are recommended in the reissued permit. Tests should be done in rotating quarters to collect seasonal information about this discharge. WET testing should continue after the permit expiration date (until the permit is reissued). Deviation from the WET checklist is made to recommend three acute WET tests in addition to the chronic WET tests during the reissued permit term.
- The COW water has shown effluent toxicity when last tested in 1999 where mainly ion deficiency and chlorine contributed to the toxicity (TRE memorandum dated July 1999). The potential discharge of COW water without chlorine and solely ion deficiency would not warrant the need for the associated WET limits. The recommended monitoring should take place after the facility is operational with the upgrades to provide updated information about the discharge and show effluent toxicity is not present from other substances excluding ion deficiency.

COW Water & Process Wastewater Mixture:

- According to the requirements specified in s. NR 106.08, Wis. Adm. Code, acute and chronic WET limits are required. The acute WET limit shall be expressed as 1.0 TU_a as a daily maximum in the effluent limits table of the permit. The chronic WET limit shall be expressed as 1.0 TU_c as a monthly average in the effluent limits table of the permit.
- The NCCW and the process wastewater both have shown toxicity when last tested in 1999 and the sources of the toxicity have not been identified at that time (TRE memorandum dated July 1999). Whether the original source of toxicity has changed from the historic WET tests and whether it would

be removed by wastewater treatment is unknown. In addition, the TRE memorandum had recommended additional efforts to classify and identify the potential sources of toxicity. Due to this repeated toxicity, it is recommended that a schedule be included in the permit which allows time for a toxicity reduction evaluation (TRE) to be completed to find and fix the source of the toxicity and achieve compliance with the new WET limits. The WET limits should become effective and monitoring recommended above should begin after the TRE schedule has been completed. Guidance related to TRE schedules is provided in Chapter 1.12 of the WET Guidance Document.

- A minimum of annual acute and chronic WET monitoring is required because acute and chronic WET limits are required. Federal regulations in 40 CFR Part 122.44(i) require that monitoring occur at least once per year when a limit is present. The recommended monitoring should take place after the facility is operational with the upgrades to provide updated information about the discharge.

PART 8 – EXPRESSION OF LIMITS

Revisions to chs. NR 106 and 205, Wis. Adm. Code align Wisconsin's water quality-based effluent limits with 40 CFR 122.45(d), which requires WPDES permits contain the following concentration limits, whenever practicable and necessary to protect water quality:

- Weekly average and monthly average limitations for continuous discharges subject to ch. NR 210.
- Daily maximum and monthly average limitations for all other discharges.

SCUSA - Almena is an industrial discharge and is therefore subject to daily maximum and monthly average limitations whenever limitations are determined to be necessary.

This evaluation provides additional limitations necessary to comply with the expression of limits in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Code. Pollutants already compliant with these rules or that have an approved impracticability demonstration, are excluded from this evaluation including water-quality based effluent limitations for phosphorus, temperature, and pH, among other parameters. Mass limitations are not subject to the limit expression requirements if concentrations limits are given.

Method for Calculation:

The methods for calculating limitations for industrial discharges to conform to 40 CFR 122.45(d) are specified in s. NR 106.07(4), Wis. Adm. Code, as follows:

1. Whenever a daily maximum limitation is determined necessary to protect water quality, a monthly average limitation shall also be included in the permit and set equal to the daily maximum limit unless a more restrictive limit is already determined necessary to protect water quality.
2. Whenever a weekly average limitation is determined necessary to protect water quality:
 - A monthly average limitation shall also be included in the permit and set equal to the weekly average limit unless a more restrictive limit is already determined necessary to protect water quality.
 - This method applies for the following constituents: cadmium, chromium, copper, lead, nickel, zinc, and chloride. Therefore, the monthly average limit(s) will be equal to the respective calculated weekly average limit(s).
 - A daily maximum limitation shall also be included in the permit and set equal to the daily maximum WQBEL calculated under s. NR 106.06 or a daily maximum limitation calculated using the following procedure, whichever is more restrictive:

Attachment #1

Daily Maximum Limitation= WQBELc × DMF

Where:

DMF = Daily Multiplication Factor as defined in Table 2

CV = coefficient of variation (CV) as calculated in s. NR 106.07(5m)

s. NR 106.07 (4) (e). Table 2 — Daily Multiplication Factor

CV	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
DMF	1.114	1.235	1.359	1.460	1.557	1.639	1.712	1.764	1.802	1.828

CV	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
DMF	1.842	1.849	1.851	1.843	1.830	1.815	1.801	1.781	1.751	1.744

- Whenever a monthly average limitation is determined necessary to protect water quality, a daily maximum limit shall be calculated using the following procedure and included in the permit unless a more restrictive limit is already determined necessary to protect water quality:

Daily Maximum Limit = (Monthly Average Limitation × MF)

Where:

MF= Multiplication factor as defined in Table 1

CV= coefficient of variation (CV) as calculated in s. NR 106.07(5m)

n= the number of samples per month required in the permit

s. NR 106.07 (3) (e) 4. Table 1 — Multiplication Factor (for CV = 0.6)

CV	n=1	n=2	n=3	n=4	n=8	n=12	n=16	n=20	n=24	n=30
0.6	1.00	1.31	1.51	1.64	1.95	2.12	2.23	2.30	2.36	2.43

Note: This methodology is based on the *Technical Support Document for Water Quality-based Toxics Control* (March 1991). PB91-127415.

- BOD₅ – The MF factor used is 1.95 based on the assumptions of CV = 0.6 and two times per week effluent monitoring scheme in absence of representative monitoring data. Multiplying the monthly average limit of 10 mg/L by 1.95 yields a daily maximum of 20 mg/L.
- Mercury – The MF factor used is 1.00 based on the assumptions of CV = 0.6 and once per month effluent monitoring scheme in absence of representative monitoring data. Multiplying the monthly average limit of 1.3 ng/L by 1.00 yields a daily maximum of 1.3 ng/L.

Summary of Additional Limitations:

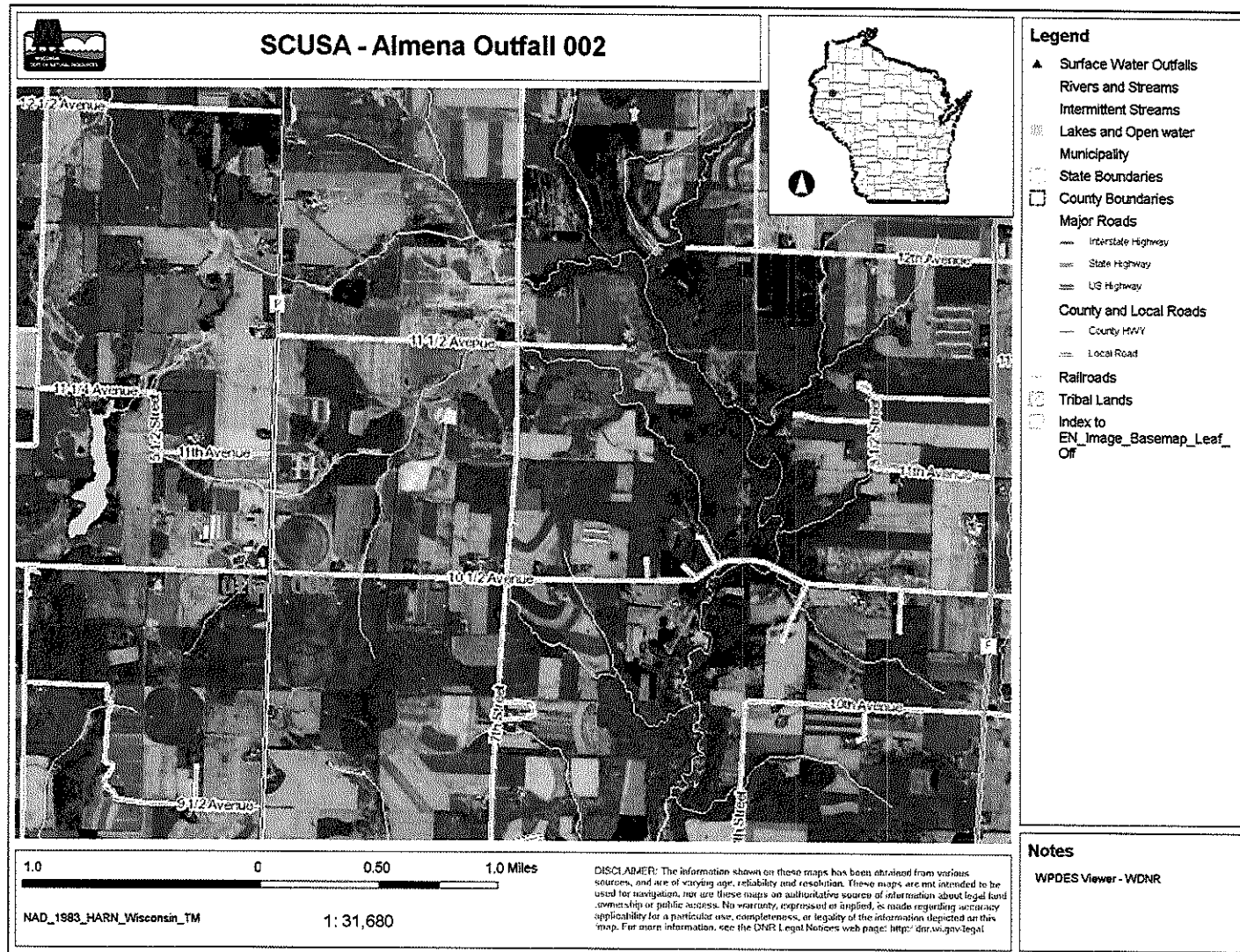
In conclusion, the following additional limitations are required to comply with ss. NR 106.07 and NR 205.065(7) Expression of Limits.

Parameter	Daily Maximum	Weekly Average	Monthly Average	Multiplication Factor (CV)	Assumed Monitoring Frequency (n)
BOD ₅	20 mg/L		10 mg/L	1.95 (0.6)	2x/wk (8)
Cadmium	15 µg/L	3.1 µg/L	3.1 µg/L		
Chloride	760 µg/L	400 µg/L	400 µg/L		

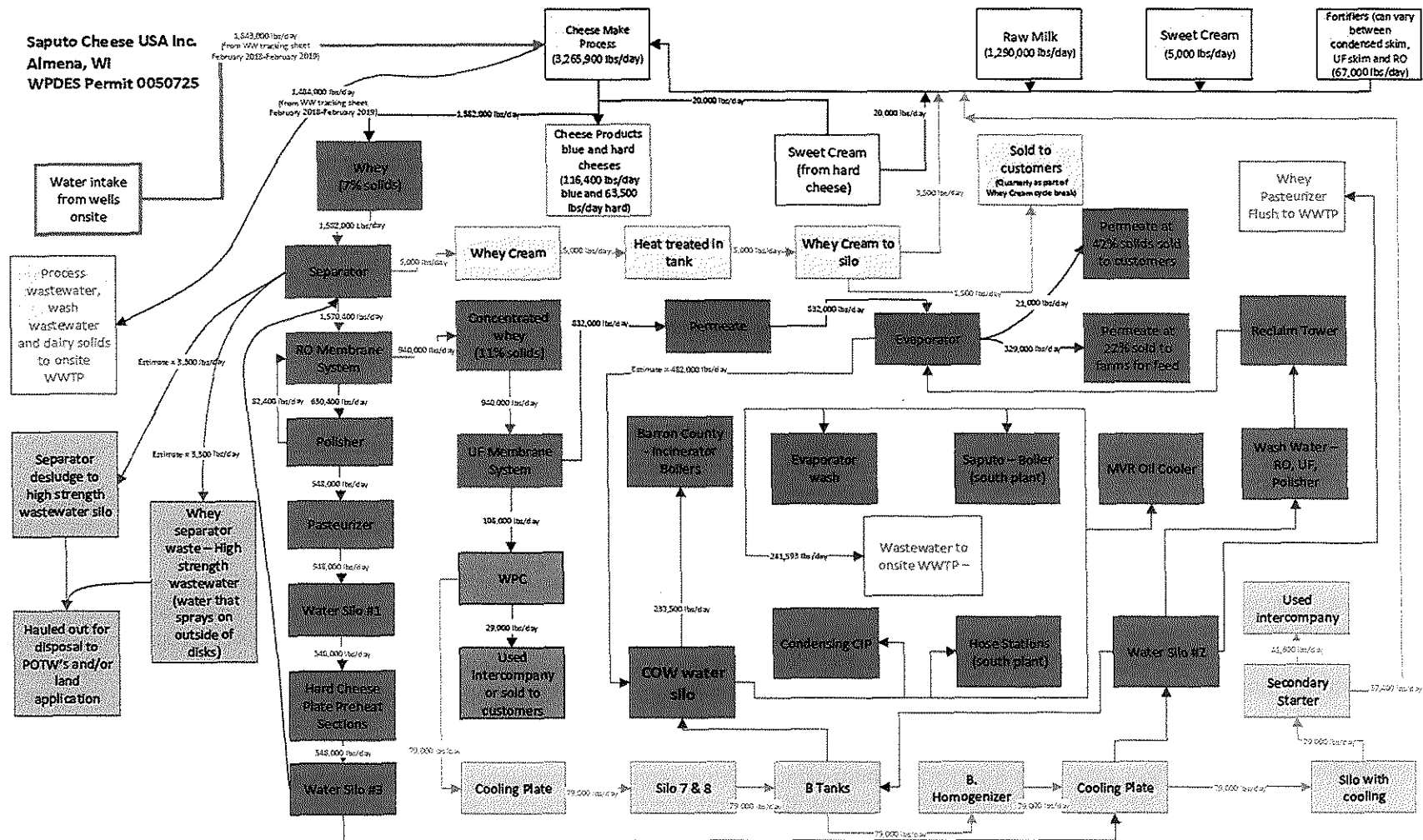
Attachment #1

Parameter	Daily Maximum	Weekly Average	Monthly Average	Multiplication Factor (CV)	Assumed Monitoring Frequency (n)
Chromium	2,300 µg/L	170 µg/L	170 µg/L		
Copper	21 µg/L	13 µg/L	13 µg/L		
Lead	140 µg/L	38 µg/L	38 µg/L		
Mercury	1.3 ng/L		1.3 ng/L	1.00 (0.6)	1x/month (1)
Nickel	610 µg/L	68 µg/L	68 µg/L		
Zinc	160 µg/L	160 µg/L	160 µg/L		

Attachment #2



Attachment #3



Technology Based BOD₅ & TSS Limits:

Chapter NR 240 Wis. Adm. Code requires effluent limits for any point source discharges of wastewater generated from processing dairy products. SCUSA – Almena generates wastewater from the following applicable processing subcategories as described in s. NR 240.02: cheese (natural/processed) and whey (condensed/dry). Therefore, technology-based effluent limits (TBEL) for BOD₅ and TSS must be evaluated at this time.

In addition to identifying final dairy products sold to consumers, the ingredients used to arrive at the product and the mass quantity (lbs/day) represented as a daily maximum need to be identified to determine the approximate BOD input generated. Actual BOD input values from production can also be used in the limits evaluation in place of the estimation. In this case, SCUSA – Almena uses three ingredients for the production of cheese and three ingredients for the production of whey at different stages of processing. The ingredients, final products, and mass values are shown in the process flow chart included as attachment #3.

The BOD input is determined using the following equation. BOD factors to translate the amount of appropriate input material used to an estimated BOD input are found in s. NR 240.07 Table 1 Wis. Adm. Code for a variety of input materials.

$$BOD\ Input\ \left(\frac{lbs}{day}\right) = \frac{Material\ Used\ \left(\frac{lbs}{day}\right) * BOD\ Factor}{100}$$

Allowance factors are used to yield a fraction of the BOD input to meet daily maximum and monthly average effluent limits for BOD and TSS based on either best available treatment or standards of performance. Allowance factors based on best available treatment and standards of performance are found in s. NR 240.11 Table 3 and s. NR 240.12 Table 4 respectively. The EPA memorandum dated September 2006 established effluent limit guideline cut-off dates for various categories of point source discharges. Facilities that were constructed or had the potential to discharge wastewater before the respective date are deemed an “existing” discharger and must meet effluent limits based on best available treatment. Similarly, facilities on and after the date are deemed “new” dischargers and must meet effluent limits based on standards of performance. In this case, the cut-off date for point source dischargers of dairy processing wastewater is 05/28/1974 and the original facility that is now SCUSA – Almena is estimated to be constructed between 1940 – 1959. Therefore, allowance factors in s. NR 240.11 Table 3 are used based on the products and ingredients for SCUSA – Almena.

The individual discharge limit for a process train is determined using the following equation for both BOD and TSS parameters for each product and respective ingredients. The final limits are the sum of the individual process train discharge limits for both BOD and TSS. The parameters used for the six applicable process trains and calculations are provided in the tables below:

Attachment #4

$$Limit \left(\frac{lbs}{day} \right) = \sum \frac{BOD \text{ Input} \left(\frac{lbs}{day} \right) * Allowance \text{ Factor}}{1000}$$

For the COW water and process wastewater mixed discharge, the calculated BOD₅ limits are 62 and 31 lbs/day expressed as a daily maximum and monthly average respectively. The calculated TSS limits are 78 and 39 lbs/day expressed as a daily maximum and monthly average respectively. The COW water only discharge would only concern the sum of the dairy process wastewater discharge limits of the whey – based products. In this case, the calculated BOD₅ limits are 34 and 17 lbs/day expressed as a daily maximum and monthly average respectively. The calculated TSS limits are 44 and 22 lbs/day expressed as a daily maximum and monthly average respectively.

Daily Maximum Limits									
Product	Production Class	Input Material	Material Used (lbs/day)	BOD Factor	BOD Input	Allowance Factor		Discharge Limit (lbs/day)	
						BOD	TSS	BOD	TSS
Cheese	A	Milk (3.7% Fat)	1,290,000	10.39	134,031	0.16	0.2	21	27
Cheese	A	Sweet Cream	5,000	39.77	1,989	0.16	0.2	0.32	0.40
Cheese	A	Condensed Milk	67,000	53.76	36,019	0.16	0.2	5.8	7.2
Condensed Whey	A	Whey	1,570,400	4.72	74,123	0.22	0.28	16	21
Dry Whey	A	Whey	1,570,400	4.72	74,123	0.22	0.28	16	21
Whey Protein Concentrate	B	Whey	108,000	4.72	5,098	0.33	0.41	1.7	2.1
						TOTAL		62	78

Monthly Average Limits									
Product	Production Class	Input Material	Material Used (lbs/day)	BOD Factor	BOD Input	Allowance Factor		Discharge Limit (lbs/day)	
						BOD	TSS	BOD	TSS
Cheese	A	Milk (3.7% Fat)	1,290,000	10.39	134,031	0.08	0.1	11	13
Cheese	A	Sweet Cream	5,000	39.77	1,989	0.08	0.1	0.16	0.20
Cheese	A	Condensed Milk	67,000	53.76	36,019	0.08	0.1	2.9	3.6
Condensed Whey	A	Whey	1,570,400	4.72	74,123	0.11	0.14	8.2	10
Dry Whey	A	Whey	1,570,400	4.72	74,123	0.11	0.14	8.2	10
Whey Protein Concentrate	B	Whey	108,000	4.72	5,098	0.16	0.2	0.82	1.0
						TOTAL		31	39

Attachment #5

Temperature Limits for Receiving Waters with Unidirectional Flow

(calculation using default ambient temperature data)

Facility:	SCUSA - Almena	7-Q₁₀:	0.00 cfs	Temp Dates	Flow Dates
Outfall(s):	002	Dilution:	25%	Start:	NA
Date Prepared:	12/17/2019	f:	0	End:	NA
Design Flow (Q_e):	0.0858/0.571 MGD	Stream type:	Small warm water sport or forage fish co ▼		
Storm Sewer Dist.	0 ft	Qs:Q_e ratio:	100 :1		
		Calculation Needed?	YES		

Month	Water Quality Criteria			Receiving Water Flow Rate (Qs) (cfs)	Representative Highest Effluent Flow Rate (Qe)		f	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Ta (default)	Sub-Lethal WQC	Acute WQC		7-day Rolling Average (Qesl)	Daily Maximum Flow Rate (Qea)		Weekly Average	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)		(MGD)	(MGD)		(°F)	(°F)	(°F)	(°F)
JAN	33	49	76	0.00	NA	NA	0			49	76
FEB	34	50	76	0.00	NA	NA	0			50	76
MAR	38	52	77	0.00	NA	NA	0			52	77
APR	48	55	79	0.00	NA	NA	0			55	79
MAY	58	65	82	0.00	NA	NA	0			65	82
JUN	66	76	84	0.00	NA	NA	0			76	84
JUL	69	81	85	0.00	NA	NA	0			81	85
AUG	67	81	84	0.00	NA	NA	0			81	84
SEP	60	73	82	0.00	NA	NA	0			73	82
OCT	50	61	80	0.00	NA	NA	0			61	80
NOV	40	49	77	0.00	NA	NA	0			49	77
DEC	35	49	76	0.00	NA	NA	0			49	76

Attachment #6

Data	Source	Start Date	End Date	Sample Count	Notes
Receiving Water - Unnamed Tributary to the Hay River					
WBIC	WPDES Viewer	-	-	-	3000238
Classification	Default classification, accordance with NC rule package	-	-	-	WWSF community
Flow (Qs)	SE ¼ - NE ¼ of Section 12; T33N – R14W	-	-	4	Estimated to be zero
Hardness	Equal to effluent hardness	-	-	-	Receiving water flow is zero
Temperature	Ambient Temperature Guidance	-	-	3	Guidance is based by classification - WWSF
pH	Ambient pH Guidance	-	-	3	Guidance is based on receiving water hardness
Multiple Dischargers	WPDES Viewer	-	-	-	None in vicinity
Alternative % Low Flow	NR 106.06(4)(c)5	-	-	-	25% default
Watershed/Basin	SWAMP	-	-	-	Hay River/Lower Chippewa River
Impaired Water Status	WPDES Viewer	-	-	-	No known impairments
Fish Species Determination	Note - s. NR106.32(3)(a)4	-	-	-	Burbot is not present
Effluent: SCUSA - Almena					
Maximum Actual Annual Flow	Facility Correspondence	-	-	2	COW water & COW/process wastewater
Process Loading	Facility Process Flowchart	-	-	-	
Hardness	Historic WET tests	Oct. 1995	Dec. 1999	13	Geometric average
Phosphorus (WLA)	TMDL Implementation Guidance	-	-	2	Tainter Lake/Lake Menomin TMDL, annual and daily mass loading
Additives	Facility Correspondence	-	-	3	Phosphoric acid, sodium hypochlorite, and sodium hydroxide
Effluent Fraction Withdraw	Permit Application	-	-	-	All effluent is discharged
Water Source (Potable)	Facility Process Flowchart	-	-	-	Private wells